School of Information Systems

Information Systems Strategy and Knowledge-Based Small and Medium-Sized Enterprises: An Investigation within the Australian Biotechnology Industry

Volume One

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Doctor of Philosophy

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Abstract

This thesis explores the nature of information systems strategy (ISS) within twelve Australian biotechnology knowledge-based small and medium-sized enterprises (KSMEs). Over the last two decades there has been considerable interest, within both the academic and business communities, on the role information systems (IS) plays in competitive advantage. To date, most of the ISS models, frameworks and techniques that have emerged, have been derived from empirical research based on large organisations. More recently, a research focus has begun to explore ISS amongst small and medium-sized enterprises (SMEs). Within this research focus, KSMEs have been identified as businesses where ISS could be particularly beneficial. Research to date investigating ISS within KSMEs has been exploratory and has tended to rely on only a single strategic management perspective, the resource-based view (RBV). A possible limitation of this perspective in respect of ISS is that it may not encapsulate the full range of sources of advantage. Furthermore, the firm-level focus of current approaches suggests that ISS theory may have had little opportunity to explore sources of competitive advantage beyond the firm boundary.

In this context, the thesis conducts research within the Australian biotechnology industry. At a substantive level, the biotechnology industry has been identified as one of the most knowledge-intensive, has yet to be explored by the IS discipline. Through the conduct and analysis of twelve case studies, this research develops an explanatory model of the nature of ISS within Australian biotechnology KSMEs. The twelve case studies involve KSMEs from both within the agriculture and human health sectors of biotechnology in Australia.

The research design encompassed four key elements - research philosophy, research strategy, research procedures and research principles. The research philosophy involved a subjective ontology and employed an interpretative epistemology. The research strategy involved three stages - familiarisation stage, pilot interview stage and a primary investigation stage. The primary investigation involved a qualitative research approach within a multiple case study framework. The primary investigation included a series of semi-structured interviews with managers of twelve Australian biotechnology KSMEs. Interview transcripts and organisational artefacts were analysed using qualitative data analysis techniques influenced by several principles often associated with grounded theory method. An inductive approach to theory generation was adopted whereby theories, concepts and models were derived directly from the data or grounded in the data.

The thesis makes contributions to IS research, particularly within the SME and ISS discourses at three levels. At the substantive level, the research provides an in-depth study of the nature of ISS within twelve KSMEs in the Australian biotechnology industry. The research provides a detailed description of the 'biotechnology landscape' and identifies a number of potential challenges, which needed to be addressed in the research design. The purpose of the detailed description is to assist with the conduct of this research but will also assist other IS researchers investigating the biotechnology industry.

At the methodological level a number of contributions are made to IS research. Firstly, an innovative approach of applying the principles of critical reflection to pre-data collection phases is developed. The adoption of critical reflection at the research design stage is shown to enhance research rigour and the explication of the appropriateness of the research design with respect to factors including the research questions and research context. Secondly, the research method also develops an approach suitable for investigating highly commercially sensitive topics. Thirdly, the research approach uses a heuristic tool, which integrates multiple levels of analysis (i.e. firm, interfirm, and industry levels). The heuristic tool is designed to assist the researcher ascertain factors that may need to be considered to model current ISS in Australian biotechnology KSMEs. Finally, a two-stage data analysis process is developed for analysing qualitative data incorporating grounded theory data analysis techniques within a multiple case study framework. The two-stage data analysis process combines the strengths of a holistic case study and a cross-case study approaches and through the selective use of grounded theory techniques, provides a method to extract rich, detailed meaning about the emergent concepts, themes and interrelationships within multiple cases. The development and deployment of the research approach was also underpinned by an awareness of Klein and Myers (1999) principles for conducting and evaluating interpretivist research.

At a theoretical level, this thesis has generated an explanatory model of factors influencing the nature of ISS within Australian KSMEs, which extends current insights into ISS in KSMEs. Several challenges in relation to the current conceptualisation of ISS are also identified in respect of reassessing strategic alignment, the conceptualisation of IT as a tool or agent of change, firm boundary permeability, the conceptualisation of SMEs and the potential application of the socio-technical perspective. In addition, it discusses the potential risk to the IS discipline if researchers continue to adopt a single strategic management perspective. The research concludes by suggesting an integrated perspective is the most appropriate approach in exploring complex, dynamic business environments. It is anticipated that the model and insights gained will lead to further advances in IS research in SMEs within the knowledge economy.

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Acronyms

ABS	Australian Bureau of Statistics
ANZFA	Australia New Zealand Food Authority
ANZSIC	Australian and New Zealand Standard Industrial Classification
APVMA	Australian Pesticides and Veterinary Medicines Authority
AQIS	Australian Quarantine and Inspection Service
AUD	Australian Dollar
CRC	Cooperative Research Centres
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVMP	Committee for Veterinary Medicinal Products under the
DNA	Deoxy Ribonucleic Acid
EMEA	European Medicines Evaluation Agency
EPC	European Patent Convention
EPO	European Patent Office
ERP	Enterprise Resource Planning
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FDA	Food and Drugs Administration
GM	Genetically Modified
GMO	Genetically Modified Organism
IP	Intellectual Property
IPR	Intellectual Property Rights
IS	Information Systems
ISAA	International Service for the Acquisition of Agri Biotech Applications
ISS	Information Systems Strategy
IT	Information Technology
KSME	Knowledge-based Small and Medium Sized Enterprises
NOHSC	National Occupational Health and Safety Commission
NRA	National Registration Authority
NSW	New South Wales

NT	Northern Territory
OECD	Organization for Economic Co-operation and Development
OGTR	Office of the Gene Technology Regulator
PBR	Plant Breeders' Right
Qld	Queensland
R&D	Research and Development
RBV	Resource-based View
SA	South Australia
SAM	Strategic Alignment Model
SIS	Strategic Information Systems
SISP	Strategic Information Systems Planning
SME	Small and Medium Sized Enterprises
SSM	Soft Systems Methodology
Tas	Tasmania
TGA	Therapeutic Goods and Drugs Administration
TRIPS	Trade-Related aspects of Intellectual Property rights
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organisation
UPOV	Union for the Protection of New Varieties of Plants
US	United States
USDA	United States Department of Agriculture
USPTO	United States Patent and Trademark Office
VMAC	Veterinary Medicine Advisory Committee
Vic	Victoria
WA	Western Australia
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation
WTO	World Trade Organization

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